DOCUMENT RESUME

ED 418 684 IR 018 714

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TITLE Students Use of Adjunctive CMC.
PUB DATE 1998-01-00
NOTE 11p.; Paper presented at the annual Distance Education Conference (fifth).
AVAILABLE FROM URL: http://www.cravener.net
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Communication Research; *Computer Mediated Communication; Discussion; Distance Education; Educational Strategies; Higher Education; Interaction; Interaction Process Analysis; *Personality; *Student Participation; Undergraduate Students
IDENTIFIERS *Face to Face Communication

ABSTRACT

This study evaluated the relationship between psychological traits of campus-based undergraduate students and their preference for face-to-face (FtF) or computer-mediated communications (CMC), investigating the validity of transferring CMC instructional strategies from distance education to traditional classrooms. Thirty-eight students (80%) of the total class of 46 students were enrolled in a Bachelor of Science in a Nursing program. Statistically significant correlations among the 19 criterion and predictor variables indicated that CMC options within this campus-based course primarily benefited those students who had higher participation rates in traditional FtF academic discussions. The underlying premise of the study, that campus-based students would show a pattern of CMC use that was different from projections that were extrapolated from the distance education literature, was upheld by the data. Students who used class and office time to talk about education-related concerns were the same individuals who used CMC in the course, while students who tended not to participate in FtF communication also tended not to use CMC for educational purposes. Patterns of communication activity for students in this class were more strongly predicted by relatively enduring personal traits of the learners than by the availability of course credit and computing equipment, even when there was strong encouragement for using CMC as a substitute for FtF interactions. Recommendations are provided. (Contains 17 references.) (SWC)

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Students Use of Adjunctive CMC

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ED 418 684

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The major purpose of this study was to evaluate the relationship between psychological traits of campus-based undergraduate students and their preference for face-to-face (FtF) or computer-mediated communications (CMC), investigating the validity of transferring CMC instructional strategies from distance education to traditional classrooms. Statistically significant correlations among the nineteen criterion and predictor variables indicated that CMC options within this campus-based course primarily benefitted those students who had higher participation rates in traditional
FtF academic discussions.

Over the past decade, expansion of network capacity has enabled widespread use of electronic communications throughout academe. Questions related to efficacy and outcomes of a variety of methods for course delivery (large lecture, small seminar sections, video-supported lectures to off-site students, interactive video-supported distant classrooms, or computer-mediated asynchronous instruction) have become central to the concept of the curriculum itself. Critical issues for decision-making concerning curriculum have come to include choices of instructional media as well as the content of academic courses.

In the United States, instructional use of information technology in higher education is now commonplace; the increasing popularity of computer-mediated communications to supplement classroom instruction has been widely documented. One consequence is new financial and infrastructure demands on universities (Rogers, 1996). The fastest growing domain of computer-use at colleges and universities has been email; the percentage of college courses using email jumped from 8% in 1994 to approximately 20% in 1995 and 25% in 1996 (Green, 1996). The most common uses of Email have been as an adjunct to class discussion, and as a means to expand access to faculty beyond office hours. The availability of easily-managed email provided an impetus for faculty to begin experimentation with the application of computer-mediated communications (CMC) to their course offerings, both in distance learning programs and in traditional campus-based courses.

CMC in Higher Education

Many faculty members believe that electronic mail will extend and amplify traditional instructor-to-student and student-to-student interactions in significant ways (Nalley, 1995). However, most of the published literature concerning uses of information technology in teaching has come from the distance education field. The summary of student satisfaction provided by Rohfeld and Hiemstra (1995) indicated that benefits of CMC perceived by distance education students were (a) increased control over learning environment,

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including time and place; (b) satisfaction in having mastered technical skills; (c) reduction of demand to respond immediately, accompanied by believing their comments were more thoughtful/reflective because of the delay imposed by writing; and (d) the timeliness and convenience of personal communication with their instructor. Students who described themselves as "timid, passive, or unable to think quickly . . .in face-to-face situations" stated that the asynchronicity of computer-mediated communication gave them time to reflect and compose their contributions to the class discussion. The authors concluded that computer-mediated communicationis valuable in itself, apart from its utility for delivering specific instructional material: ". . . helping learners take increasing control over personal learning is a goal for most educational endeavors. Computer-mediated conferencing can be supportive of such fundamental educational values" (Rohfeld & Hiemstra, p. 102).

Educators have tended to presume that similar student response effects may be obtained when the communication technology is added to traditional courses. It is widely believed that computer-mediated instructional strategies are most beneficial to students who are less inclined to compete for class discussion time, who are less able to ask assertively for help with conceptual material, who have some handicap that limits their ability to respond rapidly in class, or who have affective traits, such as high anxiety, that tend to limit their participation in classrooms (Bates, 1995). While clear and definite benefits are associated with the use of computer-mediated communications for distance learning (Tucker, 1995) it is not clear that campus-based students are a population with the same learning needs as remote students.

Problem Statement

It seems possible that the use of email, mailing lists,and hypertext linked documents as adjuncts to regular face-to-face class meetings, and their use as the primary communications modes for academicwork, represent fundamentally different teaching-learning conditions. Failure to distinguish between primary uses of computer-mediated communications (for distance education) and adjunctive use (where face-to-face interactions are available) may lead to unrealistic expectations on the part of faculty members making their first forays into the use of computer-mediated communications,and disappointed administrators who see large investments in informationtechnology yielding few, if any, gains in productivity. If observed individual differences in use of CMC, which prevail even under distance education conditions, are correlated with relatively enduring psychological traits of learners, then merely adding computer-mediated communications to existing instructional strategies may increase faculty workload without significantly improving student outcomes. This study explored the extent to which undergraduate students who were engaged in traditional, campus-based course work andwho were reluctant to talk face-to-face (FtF) in the classroom would useCMC as an alternative medium to support their participation in academic discussions. The major research purpose was to evaluate the relationship between students' preference for CMC or FtF communications and relatively enduring psychological traits of students.

Theoretical Framework

This research was predicated upon two broad theoretical bases: (a) a constructivist formulation of the nature of knowledge and (b) Carl Rogers' (1969) humanist principles of learning: "Significant learning takes place when the subject matter is perceived by the student as havingrelevance for his own purposes" (p. 158). In this study, perceived relevance is operationalized as the task value variable, which is a measure of the extent to which the student believes that the course material is worthlearning for its own sake,

independent of other desired outcomes. Von Glaserfeld (1996) succinctly summarized constructivist thinking when he observed that ". . . whatever things we know, we know only insofar as we have constructed them as relatively viable permanent entities in our conceptual world" (p.19). As students actively construct meaning in their learning environments,their attitudes and beliefs mediate the intended effects of instructionalstrategies. Where one person perceives a welcome challenge, another mayperceive a threat in the same learning activity. "Learning which involvesa change in self-organization -- in the perception of oneself -- is threateningand tends to be resisted. When threat to the self is low, experience can be perceived in differentiated fashion and learning can proceed" (Rogers,1969, p. 159). Self-reports of self-efficacy for learning and control beliefsabout learning should predict whether a student perceives adjunctive computer-mediated communications as an opportunity, a welcome challenge, or a threat.

Learning Style Differences. Rogers' person-centered philosophy of education is compatible with instructional strategies that provide support and direction for selected learners. Gerald Grow's (1991, 1994) Staged Self-Directed Learning Model describes a dependent-independent continuum of personal learning styles, which are partly related to the material to be learned and partly related to the unique personalities ofthe learners. People who are predominantly dependent learners do best when they can rely on an expert teacher to coach them in new skills. Interested learners need a teacher to guide them in setting personallearning goals and to take the lead in developing learning strategies. Involved learners need a teacher who acts as a facilitator. Self-directed learners prefer a teacher who serves as a consultant. The distance education literature, which has been the basis for most conclusions about the impact of computer-mediated communication on learning, seems to bebased on the behavior of learners in Grow's more independent categories:involved learners or fully self-directed learners. However, Pascarella and Terenzini (1991) concluded that undergraduate students who are less independent, less internally motivated, less flexible, and lower on needfor achievement tend to have higher achievement under more structured or teacher-directed instructional strategies. Thus, from a developmental perspective,Miller's (1995) finding that younger students are at high risk in distanceeducation is not surprising: less mature, less self-directed learners maynot benefit from complete independence in the learning environment.

Learner Motivation. Geisler-Brenstein, Schmeck,and Hetherington (1996) found that both self-efficacy and motivation werenegatively related to anxiety and vulnerability. They concluded that these personality variables were important moderators of learning styles: students with low self-efficacy were more likely to be concerned with social evaluations,whereas students with high academic self-efficacy were more likely to respond positively to learning challenges. Anxiety and self-efficacy were foundto act as powerful filters of experience in educational contexts (Geisler-Brensteinet al., 1996). Adapting to CMC demands tolerance of delays in response,a willingness to take public risks in learning, and other challenges thatmay be overwhelming for students with low academic self-efficacy. If theseanxious students are the ones who do not talk FtF, it does not seem reasonableto expect that they would suddenly become active participants in academicdiscussions via CMC.

Similarly, Dweck (1992) showed that individual learnerssought high grades for different reasons, ranging from proof of abilityto an index of learning. These motivations were considered to representqualitatively different classes of goals: performance goals vs. learninggoals, respectively. In the exploration of the interrelationships among intrinsic motivation, task value, and academic achievement, Heyman and Dweck (1992) concluded that distinctions between learning goals or performance goals led different individuals to

consider different kinds of information:"individuals who approach achievement situations with learning goals arelikely to think about what it is they need to do in order to improve theirskills" . . . [whereas performance-oriented learners will be focused on. . . measuring and validating their abilities]" (p. 235). That formulation of the relationship between goals and motivation implies that in situationswhere confidence is high, performance-oriented learners, whose goal isto prove competence, will be mastery oriented, but where confidence islow they will avoid challenge. Conversely, learners whose goal is to improveskills will be mastery-oriented in both high and low confidence situations,challenge-seeking with high persistence.

Methods

This study was designed as an unobtrusive observationof students' public academic communication behaviors in a campus-basedundergraduate course. Participants were students who were enrolled in athree-credit undergraduate course at a Category I university in Fall 1996.Thirty-eight students (80%) of the total of 46 students were enrolled in the Bachelor of Science in Nursing program. The class standing of students was 48% Seniors, 50% Juniors, and 2% Sophomores. Twenty-nine percent ofstudents who participated in this study had an Associate of Science degreeand 6% had a Bachelor's degree. Percentages of female and male participantswere 85 and 15, respectively. The mean age was 25.55 years, with a rangefrom 19 to 43 years.

Instructional strategies and methods of assessment ofstudent outcomes for the academic course in which students were enrolled were not modified for this research project. Data were collected from the academic records of student outcomes in regularly scheduled learning activities (Figure 1), as described and scheduled in the course syllabus.

All records were coded by the instructor prior to data analysis in such a manner that performance records were not linked to individual student identity. Correlational matrices were generated among (a) four communication content domains: course concepts clarification, assignments and grades; socialextracurricular and group activities, personal issues; (b) five demographic variables: gender, age, ethnicity, education, grade point average (GPA); (c) four indicators of baseline facility with information technology: home ownership of equipment, previous email experience, typingskills, attitude toward computers; (d) seven predictor variables representing relatively enduring psychological traits: intrinsic goal motivation, task value, self-efficacy for learning, test anxiety, extrinsic goal motivation,control beliefs about learning, extraversion-introversion; (e) two measuresof academic achievement: scores on objective examinations, final gradesfor the course; and (f) frequency of participating in CMC and FtF academicdiscussions. The hypothesized relationships among variables are shown in Figure 2.

Variables and Their Measures.

Face-to-Face (FtF) Communication. In accord with the objectives and outcome measures specified in the course syllabus, participation in class discussions was an assessment criterion for 15%of the final grade. Students were informed that taking an active part inclass discussions was important to promote learning and to demonstrate meeting course objectives. Students were given several discussion recordslips at the beginning of each class session to note their in-class participation (Smith, 1992). Record slips were 3½" x 8" sheets of paper with spaces for name, date, and topic, on which students recorded their participation in class discussions. Record slips were collected from all students atthe end of each class session, whether filled in or blank.

Computer-Mediated Communication (CMC). Studentswere informed that using the email conference list to discuss course conceptswas another way to join, continue, or initiate class discussions, and thatemail to the group list counted as active participation in class discussionfor purposes of instructor feedback and assessment of student outcomesfor the course. An email sign-up list was circulated during the first fourclass meetings. Students who did not have email accounts were told howto sign up and where to obtain instruction or assistance. Free Internetaccounts were available. Networked computers were conveniently locatedin a computer laboratory in the building where this weekly on-campus classwas held, at the main computing center, and in two university libraries.The instructor created a mailing list for the class and sent the firstmessage between the first and second classes of the semester to all studentswho had email accounts at the first class meeting. By the end of the fourthweek of class, 38 of the 46 students had signed up for the class emaillist.

Communication Content Domains. All communication events were coded with case numbers; names were removed to conceal individual identity. Subsequently, both in-class or in-office (FTF) and CMC events (email to instructor or to the class-discussion email list) were coded according to message content. Personal content was related to a student's personal concerns, sometimes inspired by course material but directed only to the instructor. Examples included posing questions about psychological status of self or family members or talking about personal aspirations and career plans. Social/group content was related to general matters for the entire group. An example of social/group content was discussing plans for class officer elections. Assignments/ grades content was related to questions about criteria for grades or assignments,or concerns about credit or points toward the final course grade. Concepts content indicated the student had been engaged in discussion or seeking clarification of the conceptual material being studied in the course, whether the question had been directed to the group or only to the instructor. Examples included asking about the difference between anxiety and fear or describing some personal experience to demonstrate effects of the concept that was the focus of discussion .

Scores for CMC and FtF communication frequencies and message content were calculated for each participant. Reliability was estimated by having the message content of approximately 20% of message records evaluated by an independent rater. Overall agreement on content domain between the reliability rater and the principal investigator was 89%: 80% for email messages and 91% for participation record slips.

Personal Traits. Psychological traits were measured with the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991). Thirty-one items from the MSLQ Motivation Scales, measuring intrinsic goal motivation, extrinsic goal motivation, control beliefs about learning, task value, self-efficacy for learning, and test anxiety were incorporated into the 54-item questionnaire devised for this study and administered to students who volunteered to complete it during orientation to the course at the first class meeting of the semester. Introversion was measured on the introversion-extraversion continuum with 7 items from the Extraversion scale of the Eysenck Personality Inventory (Wilson, 1977). Sixteen items assessed facility with technology; those questions were developed for this study.

Data analysis. For the total sample, the following analyses were performed: (a) determination of means and standard deviations forall predictor and criterion variables; (b) determination of internal-consistencyestimates of reliability for all predictor variables (coefficient alpha)and of interrater reliability for criterion variables (% agreement); and(c)

generation of correlational matrices specifying the magnitude and significanceof the interrelationships among all classificatory, predictor, and criterionvariables.

Selected Findings

The hypothesis that measures of frequency of participatingin FtF discussions would be positively related to participation rates for CMC to the class received support from the statistical analysis of data. The zero-order coefficient of correlation between total communication events (TOTALCOMM) and frequency of CMC was .593 (p = .000) and between TOTALCOMM and FTF frequency was .924 (p = .000). Figure 3 shows statistically significant coefficientsof correlation between communication frequencies in CMC and FtF modes for the entire group (n=46), by content domains.

In addition, relationships between communication mediumand concept domains include: between total FTF frequency and total contentin domains (a) concepts (.897, p = .000), (b) grades(.463, p = .001), and (c) personal (.684, p = .000);between total CMC frequency and total content in domains (a) concepts(.799, p = .000), (b) grades (.667, p = .000),and (c) personal (.805, p = .000). An even stronger relationshipbetween FtF and CMC events, not graphically displayed, was observed forthe 32 students who did not know their email addresses on the first dayof class. For that group, the overall relationship between FTF and totalfrequency of CMC was .355 (p = .023), and the correlation between total frequency of FTF communications and frequency of messages posted to the class email discussion list was .401 (p = .011). It was also observed that students in the high CMC challenge group used email with relatively less discrimination among content domains. Email messages sent by the high challenge group were heavily weighted towards the personaldomain but were approximately equally divided among the three remaining content domains. For the high challenge group, the coefficients of correlation between total frequency of CMC and frequency of communications in content domains were as follows: (a) personal .881, p = .000; (b)concepts .318, p = .038; (c) grades .388, p= .014; (d) group .300, p = .048. Students in the low CMCchallenge condition used CMC primarily to share a personal observation(.919; p=.000) and to a lesser extent to ask a question about course concepts (.568; p=.017), but seldom for message content in domain sassignments/grades or social/group. That is, low CMC challenge students were more discriminating in their usage of specific media forselected content domain than students in the high CMC challenge group, which is in accord with humanist learning theory (Rogers, 1969). Note, however, in Figure 3, that the correlation between FTF personal messages and total FTF was approximately .64; CMC was used by these campus-based students as an adjunct to FTF interactions for all content domains.

Personal Traits. For the entire group of 46 students, the coefficient of correlation between FTF and CMC, representing the sum of events in the four communication content domains for each of the two communication media was .240, narrowly missing statistical significance (p = .054). However, when the sample was divided into high-challengeand low-challenge groups on the basis of whether the student was sufficiently familiar with email to write accurately his or her Internet address on the first day of class, stronger relationships in the predicted directions were seen among measures of personal traits and communication patterns. For the 32 students who did not know their email addresses on the first day of class (the high challenge condition) the coefficient of correlationbetween total FTF and total CMC was positive and signigicant (.355, P=.023); for the 14 students in the low challenge group, the relationship was also positive, but not statistically significant (.161, p=.291). Table 1.

The observed relationship between extrinsic goal motivationand frequency of using CMC seemed to follow from the learning theory of Gerald Grow (1991, 1994): relatively dependent learners respond positively to teachers who are directive and who pose relatively structured learning tasks. As predicted by the investigator, these campus-based students appeared to fall predominantly into Grow's dependent and interested categories;the strong positive relationship between extrinsic motivation scores and CMC use patterns appeared to indicate that students in both high-challenge and low-challenge groups employed email because they perceived it to be expected by the teacher, rather than because they found CMC use met their course-related learning needs. For students in this campus-based class, it is not clear that the effect of CMC use was an increase of learner independence,a benefit frequently proposed in the distance education literature (Massy & Zemsky, 1995; McComb, 1993); CMC use among campus-based students in this sample appeared to be associated with higher scores on measures of traits indicative of dependent learning styles. For students who were not familiar with the information technologies at the beginning of the semester, intrinsic motivation (learning goals) was statistically significantly correlated with higher frequencies of FTF communication, whereas extrinsic motivation (performance goals) was associated with higher frequencies of adjunctive CMC use. For students who were skilled in the use of information technologies at the beginning of the semester, intrinsic motivation (learning goals) was significantly negatively correlated with engaging in adjunctive CMC communication. Overall, the availability of adjunctive CMC appeared to have been addressed by these campus-based students as a performance challenge rather than as an option to promote learning the subject material.

Conclusions

This study was designed to investigate the extent to which campus-based students who were not inclined to participate in FTF classroom discussions would use CMC for that purpose, and to determine which individual differences among students appeared to be associated with student selection of FtF or CMC in context of a traditional, campus-based class. The underlying premise of this study, that campus-based students would show a pattern of CMC use that was different from projections which were extrapolated from the distance education literature, was upheld by the data. Students who used class and office time to talk about education-related concerns were the same individuals who used computer-mediated communications in the course, whereas students who tended not to participate actively in face-to-face conversations also tended not to use CMC for educational purposes.Thus, the advantage most frequently asserted related to offering CMC learning activity options for class participation, " . . . with email, students who didn't talk before now do . . ." (Saltrick, 1996, p. 60; Poling, 1994), was not seen in this investigation of student communication behaviors.The content of FTF and CMC messages was similar. Educational advantagesof adjunctive CMC for campus-based students appeared to be related predominantly to expansion of time for access to faculty for high-frequency communicators.

Patterns of communication activity for undergraduate students in the context of this class were more strongly predicted by relativelyenduring personal traits of the learners than by the availability of coursecredit and computing equipment, even when strong encouragement supportedthe use of CMC as a substitute for FTF interactions. This essential findingcontradicts popular assertions that computer-mediated communications optionsper se are particularly beneficial for students who are reluctantto talk in the classroom. Students who tended to engage in in-class orin-office (FTF) discussions were also likely to use email for further course-relateddiscussions, whereas students who did not participate in FTF discussionsdid not tend to use email as a substitute, even under the

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conditions ofthis study (which provided encouragement for computer-mediated discussions,convenient access to computers, email accounts, and technical support,with incentives for learning activities in either modality).

All non-significant relationships observed between communicationpatterns and measures of personal traits were in predicted directions,which lends further credence to the hypothesis that relatively enduring psychological traits of students rather than the CMC option determine educationalcommunication behaviors for campus-based students. Strong conclusions cannotbe based on this finding, as the number of subjects was small enough thatthe possibility of Type I errors continues to intrude. However, the relationshipbetween extrinsic goal motivation and CMC use for this campus-based sample,together with the evidence of differential use of patterns of the high-challenge and low-challenge student groups, suggests that campus-based students appearedto have treated the availability of adjunctive CMC as an additional learning task rather than as a communication resource. That is, adjunctive use ofCMC appeared to be a performance-related task rather than, as in distanceeducation, intrinsically associated with learning processes as the primary medium supporting dialogue among members of the learning group.

It seems safe to predict that distance education will provide the predominant means of access to lifelong learning and continuing professional education for today's undergraduate students. Carl Rogers (1969) wrote: ". . . the goal of education . . . is the facilitation of changeand learning. The only man who is educated is the man who has learned how to learn; the man who has learned how to adapt and change; the man who has realized that no knowledge is secure, that only the process of seeking knowledge gives a basis for security" (p. 104). Gender bias aside, thestudent we educate in the 1990s and beyond must be competent with the changing processes that support seeking digitalized information, interactions among members of learning groups, and knowledge through networked computers. In the Information Age, competent use of information technology is the equivalent of basic literacy. Training in the use of computers for communication and information management is the new version of writing across the curriculum, updated for the competencies demanded by the information age.

However, simply adding adjunctive CMC to all undergraduate courses is not likely to be a cost effective strategy for the institution, if there is a low educational benefit for students in return for the cost in faculty time. It can be anticipated that both faculty and students will require substantial support if curricula are to be adapted to meet 21st century needs in higher education. Instructional strategies that are effective for distance learning cohorts may not transfer efficiently back to the campus. The widespread belief that use of CMC in higher education benefits students who shy, for whom English is not the native language, or who for other reasons feel disadvantaged in classroom settings was not supported in this study. Sound strategies must be developed to assist reluctant CMCusers with mastering the knowledge of skills they will need to become lifelong learners in the Age of Information, and to ensure maximum educational benefit for learners in return for costs related to faculty time and infrastructure maintenance.

Recommendations.

1. Decisions to integrate CMC with campus-based courses should be based on the extent to which achieving competency with information technology is a course goal, capitalizing the tendency of more dependent students to engage in assigned learning activities.

2.If adjunctive CMC is widely utilized in writing-across-the-curriculum educational paradigms, plans should include a substantially larger than usual allowance for faculty hours to be set aside for student conferences.
3.Professional development resources currently targeted predominantly for the benefit of distance education instructors, such as workshops to improve skills with mediating online discussion groups, efficient management of student email, and facility with a variety of course management programs, should be expanded to include faculty whose teaching is campus based.

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